Editorial

General Thoracic Surgery and Science: It All Takes Time

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Maybe this is the era of "contraction."

In the United States, we have been warned by major league baseball that because of revenue losses, at least two major league teams are going to be removed from the league. Curiously enough, there is much discussion (and action) for contraction of the length of specialty residencies in the United States also, with a more streamlined training of thoracic surgeons by decreasing general surgery time. Moreover, citing "life style" changes, many residents are opting not to pursue training in thoracic surgery, and this is reflected by the contraction in the number of applicants for the matching program in the United States. The pervading theme in surgery contractions is *time*; too much devoted to the training, not enough out of the hospital, not enough for reading.

I am worried about another casualty of thoracic surgical time contraction and that casualty could be the development of the thoracic surgical scientist. In the "old days" of cardiothoracic surgery (1960-1980), you could almost depend on most surgery programs in the United States to encourage residents to spend some time in the lab either at the programs university, or at some other university, or at the National Institutes of Health. You wore your laboratory time as a badge of honor, and blasted through experiments to have enough data for the American College of Surgery Surgical Forum or for scientific presentations at specialty meetings. Part of your reward for those one or two years was a presentation at a meeting, shaking hands with the first of a crop of "new translationalists" in cardiothoracic surgery including David Sabiston, James Hardy, Norman Shumway, Albert Starr, Michael DeBakey, Denton Cooley, James Kirklin and a host of others who developed North American cardiac surgery.

Well, I could argue that cardiac surgery's step-brother, general thoracic surgery, is now "growing up" and we are in danger of having a whole generation of fast-tracked residents lose out on the exploding opportunities for translational research in this field. I am talking about the type of research that starts with glazy-eyed but always inquisitive residents who get an idea for a testable question in the laboratory which has been stimulated by either (1) agonizingly long cases, (2) agonizingly miserable results, or (3) agonizingly profound sorrow with a feeling of helplessness when you lose a patient.

Oncology, specifically thoracic oncology, can be characterized with the "half-glass empty" attitude of (1), (2), and (3) above, but as an advocate of the "half-glass full" philosophy for this discipline, I worry about the lack of exposure to science that thoracic residents in the future will have. Moreover, the thoracic surgeon must be more than specimen vampires; they must understand the science, should be able to converse with the principle investigators, i.e. scientists, for the study, and understand the advantages and the flaws of the methods and the results.

These seemingly naive demands for the continued evolution of "physician scientists" in the surgical world of contraction are only justified if the promise of the new science is worth it. Ready or not, I think the new science *is* worth it, and permit me to give some examples where thoracic surgeons should focus their efforts by eating at the same table with the PhDs and medical oncologists.

1. Early detection and characterization of lung cancer: Thoracic surgeons can be the gatekeepers for the management of patients with helical computed tomographic lesions. There is no better example of this than in Japan where many of the issues of the "ground glass opacities" are being investigated by thoracic surgeons. This type of science is on a "macroscopic scale", i.e. some mass is detected on a imaging study. However, the surgeon must be involved with the science on the microscopic side, because pretty soon the promise of finding a needle in a haystack is going to come to fruition. Surgeons need to be in there mulling through the haystack! Why? There has been a proliferation of techniques which

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are characterizing preneoplasia and established cancer using the human genome including serial analysis of gene expression (SAGE) and gene expression arrays. The haystack (i.e. the ability to characterize or prognosticate for a given cancer) is getting smaller as the needle(s) (i.e. genes or proteins which define a given cancer) are getting bigger and more uniform.

2. Early detection and characterization of thoracic malignancies using proteomics: The holy grail of early detection is to be able to define preneoplastic changes using intermediate markers of carcinogenesis development. Proteins that are expressed as a result of ongoing neoplastic development are harbingers of future events and using mass spectroscopy and two dimensional gels, it is now possible to identify unique proteins which appear in the serum which could predate overt cancer development. Thoracic surgeons have access to patients in whom proteomic studies can be performed because of their endoscopic talents using autofluorescence bronchoscopy. The possibilities for examination are endless including not only analyses of serum but also of sputum and pleural effusions.

3. Investigating orphan diseases which require surgical intervention: Novel treatment approaches for diseases such as mesothelioma are really falling into the hands of surgeons. Intraoperative therapies, postoperative adjuvants, as well as genetic based therapies and molecular prognostication efforts are all being led by thoracic surgical oncologists.

Obviously, residency programs cannot predict which individuals are going to be motivated to spend the time (there is that word again!) to be involved with a benchwork project which complements their clinical pathway. The desire to be stimulated by such efforts is a combination of innate and acquired behaviors. Stimulation takes time, mentoring takes time, and science takes time. I personally do not think that we can afford to allow time contraction for residency training influence the grooming of a special breed of thoracic surgical physician-scientists, especially when our understanding of basic molecular events is expanding. In fact, the curricula for training thoracic surgeons, apart for independent study in a mentored laboratory, must begin to accommodate *time* to educate ALL trainees on the translational importance of these new events so they will understand the pathogenesis of thoracic diseases at the molecular level. Such teaching will make it all the easier when there is commercialization of these discoveries for early detection and intervention.

Time flies when you are having fun, and believe it or not, scientific correlation and discovery can be fun.

Take my word for it, just give it time, *please*?